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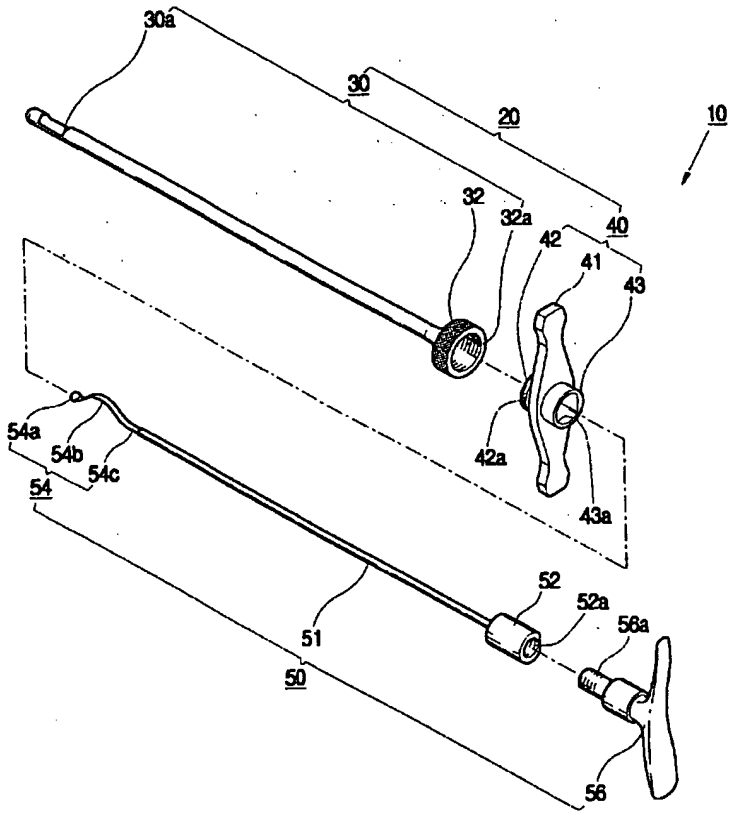
(54) Title: APPARATUS OPERATING BACKBONE



(57) Abstract: A device for operating a backbone, adapted for being inserted into a desired region in the backbone to thereby secure a space to be filled with artificial cement. A body member is defined at one end thereof with an opening, and has at the other end thereof with a support flange. An operating member has a movable bar inserted into the body member, an elastic part a portion of which can project out of the opening, and a compressing part for compressing and decompressing the movable bar so that the elastic part can be moved between an operating position in which a portion of the elastic part projects out of the opening to secure the space to be filled with artificial cement and a non-operating position in which the portion of the elastic part does not project out of the opening.

WO 2004/049961 A1

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

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APPARATUS OPERATING BACKBONE

Technical Field

The present invention relates, in general, to a device for operating a backbone and, more particularly, to a device for operating a backbone, which has a simple construction to be conveniently manipulated by one operator and allows an operation for securing a space to be filled with artificial cement, to be stably implemented in the vertebral column.

Background Art

Osteoporosis is a systemic skeletal disease in which the bone becomes increasingly porous and brittle owing to a decrease in bone mass and deterioration of bone tissue. With a consequent increase in bone fragility, osteoporosis may cause fractures of hip, spine, wrist, or the like. It is known that Asians and in particular, women are at higher risk to osteoporosis.

It is known that typically the elderly develop osteoporosis. However, as it is disclosed in the art that even young women are at risk of osteoporosis, the seriousness of osteoporosis increases.

Osteoporosis fully develops without a person's knowledge and thus is called a silent disease. When osteoporosis is fully developed, substantial and costly treatment is required and difficulties arise in completely treating osteoporosis. Therefore, it is necessary to prevent in advance the development of osteoporosis. Precautionary measures for preventing osteoporosis include periodic inspection, adequate intake of calcium and vitamin D, weight-bearing exercise, no smoking, moderation in drinking, and a healthy lifestyle.

However, it is in fact impossible for busy moderners to pursue the limited and strict living standards. In this regard, if osteoporosis is developed, it is needed to prevent osteoporosis from transferring to other bones of the body by

implementing an appropriate operation.

A way of operating a backbone of a person suffering from osteoporosis is illustrated in Figs. 5a through 5c. As shown in these drawings, if osteoporosis is developed, since the backbone, designated by the character 'B', becomes increasingly porous and brittle owing to a decrease in bone mass and deterioration of bone tissue, it is necessary to fill artificial cement, designated by the character 'C', in the deteriorated region of the backbone B so that the backbone B is prevented from being further deteriorated in its tissue.

To this end, in the conventional art, a separate device 110 for operating a backbone is inserted into the backbone B suffering from osteoporosis to secure a space designated by the character 'S', which is to be filled with the artificial cement C. The conventional backbone-operating device 110 comprises an elongate rod-shaped body part (not shown) which accommodates therein predetermined working fluid, an expandable rubber tube 154 which is inserted into the backbone B along with one end of the body part, and a pump (not shown) which is provided to the other end of the body part to expand the rubber tube 154.

Upon operating the backbone B using the device constructed as mentioned above, a separate hollow bar 101 is initially placed at the region of the backbone B, where bone mass is decreased and bone tissue is deteriorated. Then, the rubber tube 154 and the one end of the body part are inserted through the hollow bar 101, with the pump appropriately grasped by hands, so that the rubber tube 154 is positioned in the region where bone mass is decreased and bone tissue is deteriorated. Thereafter, the pump is activated so that the working fluid accommodated in the body part expands the rubber tube 154 (see the one-dot chain line in Fig. 5a).

If the rubber tube 154 is expanded, as a portion of the backbone B is slightly biased upward, the space S to be filled with the artificial cement C is secured in the backbone B. When the space S to be filled with the artificial cement C is secured in this way, the rubber tube 154 is contracted through the deactivation of the pump and removed along with the backbone-operating device

110. Thereupon, by filling the artificial cement C in the space S, treatment of osteoporosis is completed.

Nevertheless, the conventional device for operating a backbone suffers from defects in that the working fluid for expanding the rubber tube 154 should be accommodated in the body part, separate sealing task should be conducted to prevent the working fluid from leaking between the body part and the pump, and additional parts for activating the pump are required. As a consequence, due to a complicated construction, manufacturing costs of the backbone-operating device 110 cannot help but be increased.

Also, in order to expand the rubber tube 154, because one person must grasp the backbone-operating device 110 and another person must activate the pump, it is difficult for one person to appropriately treat osteoporosis. Moreover, when considering the fact that the rubber tube 154 is apt to be torn or burst, stability cannot be ensured while operating the backbone B.

Disclosure of the Invention

Accordingly, the present invention has been made keeping in mind the above problems occurring in the prior art, and an object of the present invention is to provide a device for operating a backbone, which has a simple construction to be appropriately manipulated by one operator and allows an operation for securing a space to be filled with artificial cement, to be stably implemented in the vertebral column.

In order to achieve the above object, according to one aspect of the present invention, there is provided a device for operating a backbone, adapted for being inserted into a desired region in the backbone to thereby secure a space to be filled with artificial cement, the device comprising: a body member possessing an elongate rod-shaped configuration, defined adjacent to one end thereof with an opening, and having at the other end thereof with a support flange; and an operating member having a movable bar movably inserted into the

body member, an elastic part provided to one end of the movable bar so that a portion of the elastic part can project out of the opening of the body member, and a compressing part provided to the other end of the movable bar to compress and decompress the movable bar so that the elastic part can be moved between an operating position in which a portion of the elastic part projects out of the opening of the body member to secure the space to be filled with the artificial cement and a non-operating position in which the portion of the elastic part does not project out of the opening of the body member.

According to another aspect of the present invention, the body member comprises a first unit part having one end adjacent to which the opening is defined and the other end which is formed with a first coupling portion, and a second unit part having a second coupling portion which is formed on one surface of the support flange to be coupled to and decoupled from the first coupling portion.

According to another aspect of the present invention, the opening is defined at a location which is separated from the one end of the first unit part by a predetermined distance along an axial direction of the first unit part.

According to another aspect of the present invention, in the second unit part, a first boss portion which is defined with a non-circular boss hole is formed on the other surface of the flange, opposing the one surface on which the second coupling portion is formed.

According to still another aspect of the present invention, the other end of the movable bar is formed with a second boss portion which is to be engaged into the boss hole of the first boss portion, and the compressing part is coupled to and decoupled from the second boss portion.

According to yet still another aspect of the present invention, the elastic part of the operating member has a stopper which is placed in a distal end of the first unit part of the body member, a fastening portion which is integrally fastened to the movable bar in opposition to the stopper, and a leaf spring which has a configuration of a thin plate connected at both ends thereof to the stopper and the

fastening portion, respectively, to project out of the opening when the compressing part is pressed.

Brief Description of the Drawings

The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:

Fig. 1 is an exploded perspective view illustrating a device for operating a backbone in accordance with an embodiment of the present invention;

Fig. 2 is a partially enlarged perspective view illustrating an assembled state of the device for operating a backbone according to the present invention;

Fig. 3 is a partially enlarged perspective view illustrating a state wherein the device for operating a backbone shown in Fig. 2 is manipulated;

Figs. 4a through 4d are cross-sectional views schematically illustrating a procedure for operating a backbone using the backbone-operating device according to the present invention; and

Figs. 5a through 5d are cross-sectional views schematically illustrating a procedure for operating a backbone using the conventional backbone-operating device.

Best Mode for Carrying Out the Invention

Reference will now be made in greater detail to a preferred embodiment of the invention, an example of which is illustrated in the accompanying drawings. Wherever possible, the same reference numerals will be used throughout the drawings and the description to refer to the same or like parts.

If osteoporosis is developed, since the backbone designated by the character 'B' becomes increasingly porous and brittle owing to a decrease in bone mass and deterioration of bone tissue, it is necessary to fill artificial cement

designated by the character 'C' in the deteriorated region of the backbone B so that the backbone B is prevented from being further deteriorated in its tissue.

To this end, in the present invention, a device 10 for operating a backbone constructed as described below is inserted into the backbone B to secure a space designated by the character 'S', which is to be filled with the artificial cement C. Then, the artificial cement C is filled in the space S.

As shown in Figs. 1 through 3, the device 10 for operating a backbone in accordance with an embodiment of the present invention comprises a body member 20, and an operating member 50 to be inserted into and removed from the body member 20.

The body member 20 is composed of first and second unit parts 30 and 40 which are coupled to and decoupled from each other. The reason why the first and second unit parts 30 and 40 are detachably assembled with each other is in that, because a portion of the first unit part 30 is inserted into the backbone B, the first unit part 30 need be replaced with a new one every time an operation is implemented for each patient, and, because the second unit part 40 is not inserted into the backbone B, the second unit part 40 not need be replaced.

The first unit part 30 has a hollow elongate rod-shaped configuration. An opening 30a is defined adjacent to one end of the first unit part 30, and a first coupling portion 32 to be coupled to the second unit part 40 is formed on the other end of the first unit part 30.

The opening 30a is defined in the shape of a slot at a location which is separated from the one end of the first unit part 30 by a predetermined distance along an axial direction of the first unit part 30. The first coupling portion 32 has a greater diameter than other portions of the first unit part 30, and a first internal thread 32a is formed on an inner surface of the first coupling portion 32.

The second unit part 40 to be coupled to and decoupled from the first unit part 30 includes a support flange 41, a second coupling portion 42 which is formed on one surface of the support flange 41 to be coupled to the first coupling portion 32 of the first unit part 30, and a first boss portion 43 which is formed on

the other surface of the flange 41 and has a non-circular boss hole 43a.

The support flange 41 serves as a base for supporting the fingers except for the thumb so that the device 10 for operating a backbone according to the present invention can be manipulated with one hand. A first external thread 42a to be threadedly coupled to the first internal thread 32a of the first coupling portion 32 is formed on an outer surface of the second coupling portion 42.

The operating member 50 which is inserted through the boss hole 43a of the body member 20 to reach the opening 30a, has a movable bar 51 which is movably inserted into the first unit part 30 of the body member 20, an elastic part 54 which is provided to one end of the movable bar 51 so that a portion of the elastic part 54 can project out of the opening 30a of the body member 20, and a compressing part 56 which is provided to the other end of the movable bar 51 to compress and decompress the movable bar 51 so that the elastic part 54 can be moved between an operating position (see the enlarged part "A" in Fig. 3) in which a portion of the elastic part 54 projects out of the opening 30a of the body member 20 to secure the space S to be filled with the artificial cement C and a non-operating position (see the enlarged part "B" in Fig. 2) in which the portion of the elastic part 54 does not project out of the opening 30a of the body member 20.

The movable bar 51 has the shape of a relatively thick wire to be inserted into the first unit part 30. A second boss portion 52 to be engaged into the boss hole 43a of the first boss portion 43 is formed on the other end of the movable bar 51. A second internal thread 52a is formed on an inner surface of the second boss portion 52, and a second external thread 56a to be detachably coupled to the second internal thread 52a is formed on an outer surface of one end of the compressing part 56.

The reason why the movable bar 51 and the compressing part 56 are separately formed from each other is in that, as in the case of the first and second unit parts 30 and 40, only the movable bar 51 is inserted into the backbone B and the compressing part 56 is not inserted into the backbone B.

The elastic part 54 has a stopper 54a which is placed in a distal end of the first unit part 30 of the body member 20, a fastening portion 54c which is integrally fastened to the movable bar 51 in opposition to the stopper 54a, and a leaf spring 54b which has a configuration of a thin plate connected at both ends thereof to the stopper 54a and the fastening portion 54c, respectively, to project out of the opening 30a when the compressing part 56 is pressed.

Hereafter, a procedure for operating the backbone B using the backbone-operating device 10 according to the present invention, constructed as mentioned above, will be described with reference to Figs. 4a through 4d.

First, the backbone-operating device 10 is partially assembled so that the body member 20 and the operating member 50 are coupled to each other. Concretely speaking, the first and second unit parts 30 and 40 are assembled with each other so that the first external thread 42a of the second coupling portion 42 formed on the second unit part 40 is threadedly coupled to the first internal thread 32a of the first coupling portion 32 formed on the first unit part 30. In the same way, the movable bar 51 and the compressing part 56 are assembled with each other so that the second external thread 56a formed on the one end of the compressing part 56 is threadedly coupled to the second internal thread 52a of the second boss portion 52 formed on the movable bar 51.

Then, the elastic part 54 of the operating member 50 is inserted through the boss hole 43a which is defined through the second unit part 40. After the insertion is completed, the stopper 54a formed on the elastic part 54 is brought into contact with the distal end of the first unit part 30, and the second boss portion 52 of the operating member 50 is engaged into the boss hole 43a of the second unit part 40 so that the operating member 50 inserted into the body member 20 cannot be rotated in the body member 20.

If the assembly of the backbone-operating device 10 is completed in this way, a separate hollow bar 1 is placed at a region of the backbone B, where bone mass is decreased and bone tissue is deteriorated. Then, the support flange 41 and the compressing part 56 are grasped by one hand. That is to say, the fingers

except the thumb are placed on the support flange 41, and the palm of the hand comes into contact with the compressing part 56.

With the support flange 41 and the compressing part 56 grasped as just described above, as shown in Fig. 4a, the backbone-operating device 10 is inserted into the hollow bar 1 so that the elastic part 54 is positioned in the region where bone mass is decreased and bone tissue is deteriorated.

Thereafter, the compressing part 56 is pressed by the palm of the hand while being centered on the support flange 41. By this, the compressing part 56 is moved toward the opening 30a in the first unit part 30 of the body member 20. At this time, due to the fact that the stopper 54a of the elastic part 54 is positioned at the distal end of the first unit part 30, under the influence of the compressing force, the leaf spring 54b projects out of the opening 30a to be convexed.

As the leaf spring 54b of the elastic part 54 is exposed to the outside through the opening 30a, a cavity is created in the backbone B to have a volume corresponding to that by which the leaf spring 54b is exposed to the outside. The cavity serves as the space S to be filled with the artificial cement C.

If the space S to be filled with the artificial cement C is secured, as shown in Fig. 4c, the force applied to the compressing part 56 is removed so that the leaf spring 54b of the elastic part is returned to its original position. Thereupon, after removing the backbone-operating device 10 from the hollow bar 1, by introducing artificial cement C through the hollow bar 1 as shown in Fig. 4d so that the space S is filled with the artificial cement C, treatment of osteoporosis is then completed.

As can be readily understood from the above descriptions, the backbone-operating device 10 according to the present invention provides advantages in that, since the device 10 has a simple construction, manufacturing costs are reduced, and since the device 10 can be manipulated with one hand, an operation can be conveniently implemented. Also, because the space S to be filled with the artificial cement C can be secured only through application of the force to the compressing part 56, a safety issue is not roused as in the case that the rubber

tube 154 (see Figs. 5a through 5c) is torn or burst in the conventional art, whereby it is possible to secure stability while operating the backbone B.

While the above embodiment was described in respect of operating the backbone B in an effort to treat osteoporosis, even in the case that osteoporosis is developed in other bones other than the backbone B, the backbone-operating device 10 according to the present invention can be appropriately employed.

In the above embodiment, it was described that the first internal thread 32a is formed on the inner surface of the first coupling portion 32 of the first unit part 30, and the first external thread 42a is formed on the outer surface of the second coupling portion 42 of the second unit part 40. However, it can be envisaged that an external thread is formed on an outer surface of the first coupling portion 32 of the first unit part 30, and an internal thread is formed on an inner surface of the second coupling portion 42 of the second unit part 40. Also, it can be contemplated that the first and second unit parts 30 and 40 can be coupled to and decoupled from each other using a hook type coupling mechanism other than the threaded coupling pattern.

Further, while it was described that the second internal thread 52a is formed on the inner surface of the second boss portion 52 and the second external thread 56a is formed on the outer surface of the one end of the compressing part 56, it can also be envisaged that the internal thread is formed on the one end of the compressing part 56 and the external thread is formed on the second boss portion 52.

Industrial Applicability

As apparent from the above description, the present invention provides a device for operating a backbone, which has a simple construction to be appropriately manipulated by one operator and allows an operation for securing a space to be filled with artificial cement, to be stably implemented in the vertebral column.

Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

Claims

1. A device for operating a backbone, adapted for being inserted into a desired region in the backbone to thereby secure a space to be filled with artificial cement, the device comprising:

a body member possessing an elongate rod-shaped configuration, defined adjacent to one end thereof with an opening, and having at the other end thereof with a support flange; and

an operating member having a movable bar movably inserted into the body member, an elastic part provided to one end of the movable bar so that a portion of the elastic part can project out of the opening of the body member, and a compressing part provided to the other end of the movable bar to compress and decompress the movable bar so that the elastic part can be moved between an operating position in which a portion of the elastic part projects out of the opening of the body member to secure the space to be filled with the artificial cement and a non-operating position in which the portion of the elastic part does not project out of the opening of the body member.

2. The device as set forth in claim 1, wherein the body member comprises a first unit part having one end adjacent to which the opening is defined and the other end which is formed with a first coupling portion, and a second unit part having a second coupling portion which is formed on one surface of the support flange to be coupled to and decoupled from the first coupling portion.

3. The device as set forth in claim 2, wherein the opening is defined at a location which is separated from the one end of the first unit part by a predetermined distance along an axial direction of the first unit part.

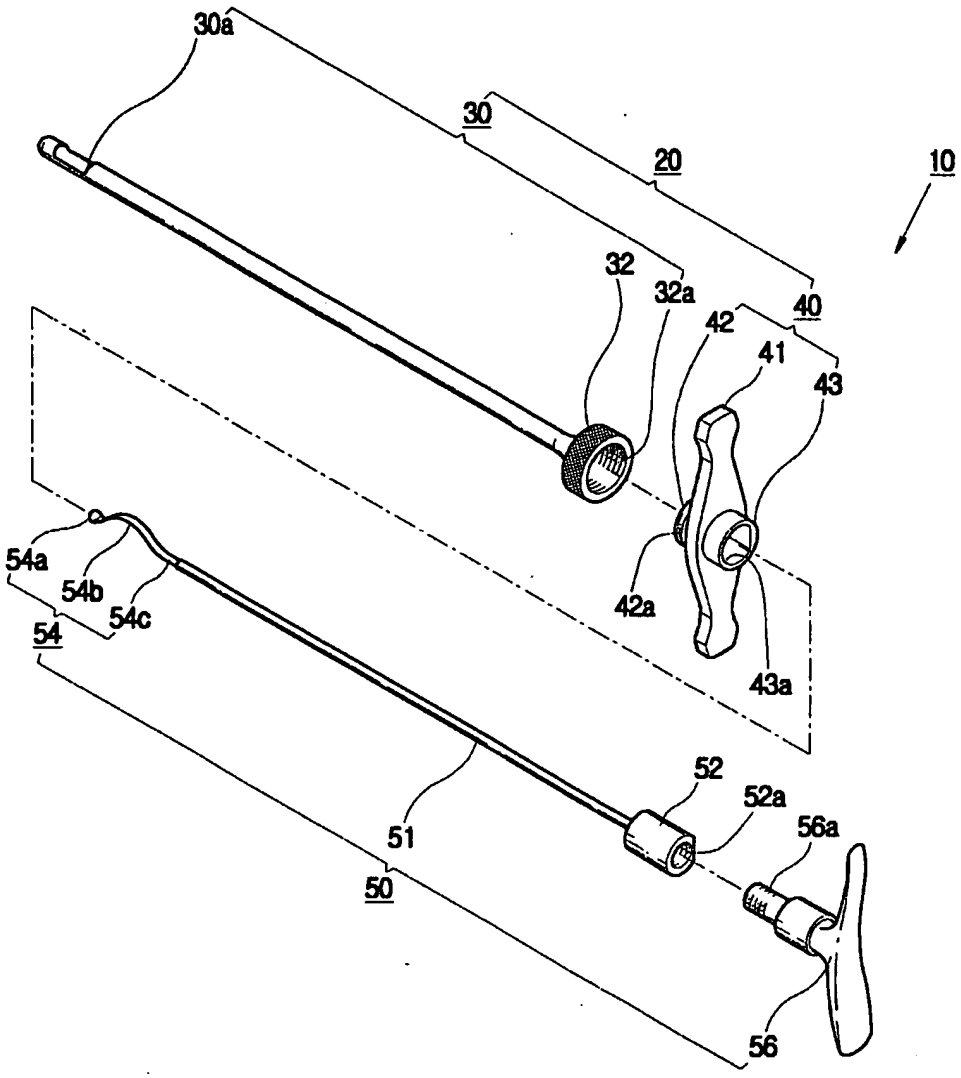
4. The device as set forth in claim 2, wherein, in the second unit part, a

first boss portion which is defined with a non-circular boss hole is formed on the other surface of the flange, opposing the one surface on which the second coupling portion is formed.

5. The device as set forth in claim 4, wherein the other end of the movable bar is formed with a second boss portion which is to be engaged into the boss hole of the first boss portion, and the compressing part is coupled to and decoupled from the second boss portion.

6. The device as set forth in any one of the claims 1 to 5, wherein the elastic part of the operating member has a stopper which is placed in a distal end of the first unit part of the body member, a fastening portion which is integrally fastened to the movable bar in opposition to the stopper, and a leaf spring which has a configuration of a thin plate connected at both ends thereof to the stopper and the fastening portion, respectively, to project out of the opening when the compressing part is pressed.

FIG 1


30a
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32
32a
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54a
54b
54c
54
42a
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52a
56a
51
50
56

FIG 2

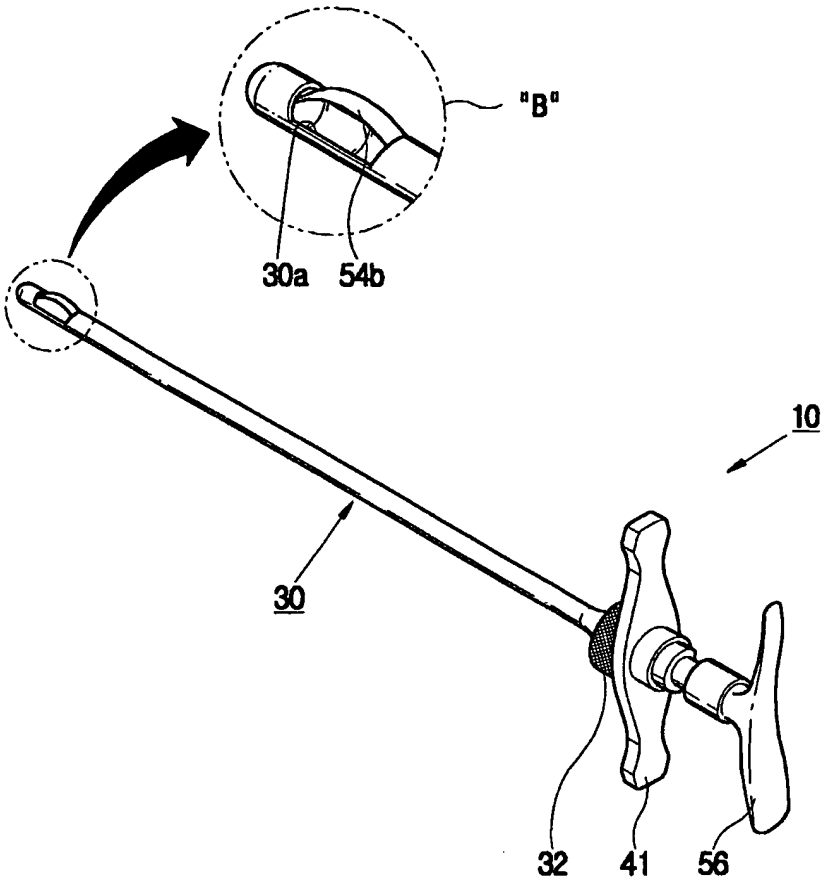


FIG 3

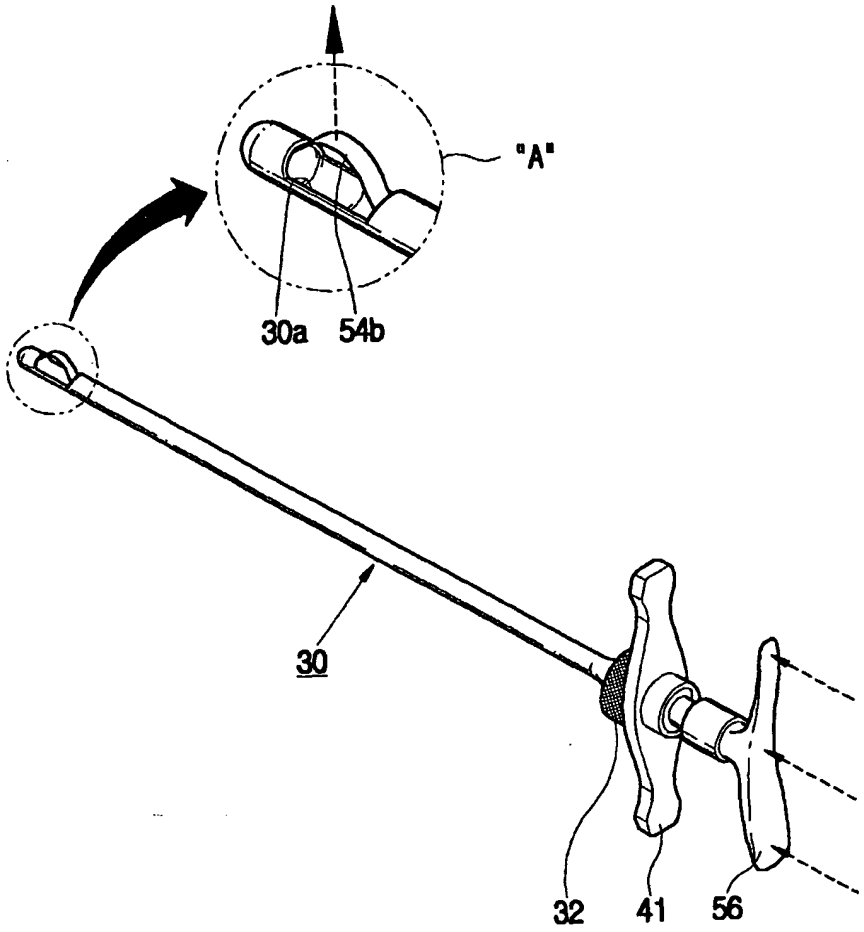


FIG 4a

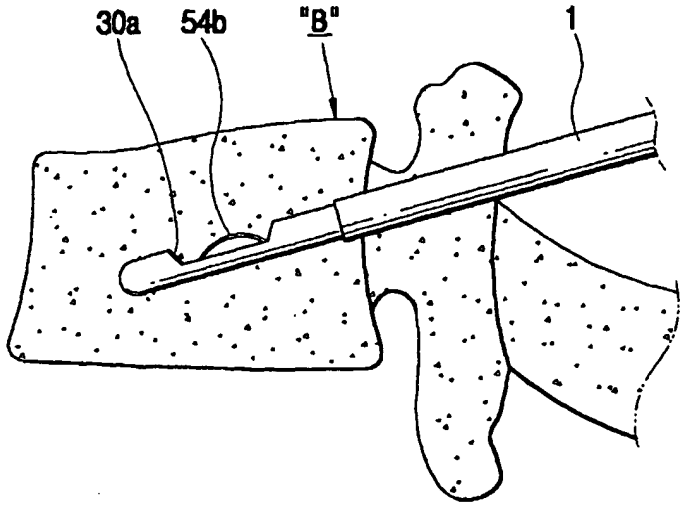


FIG 4b

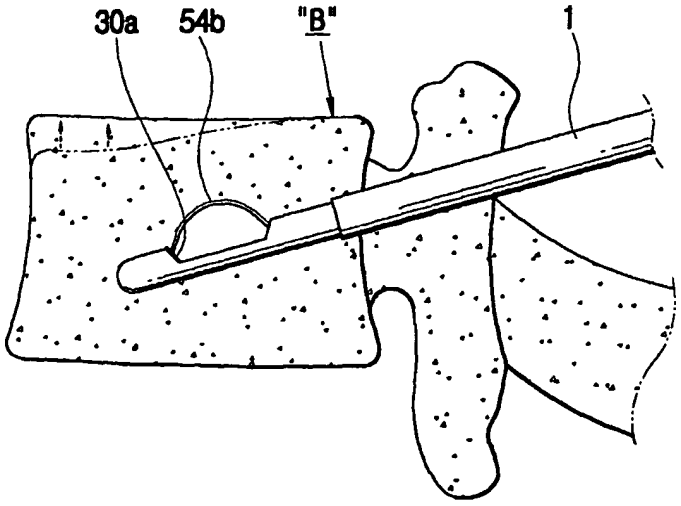


FIG 4c

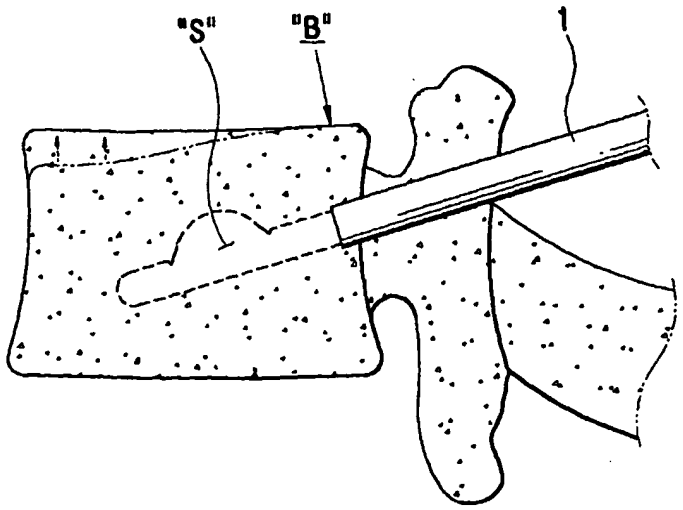


FIG 4d

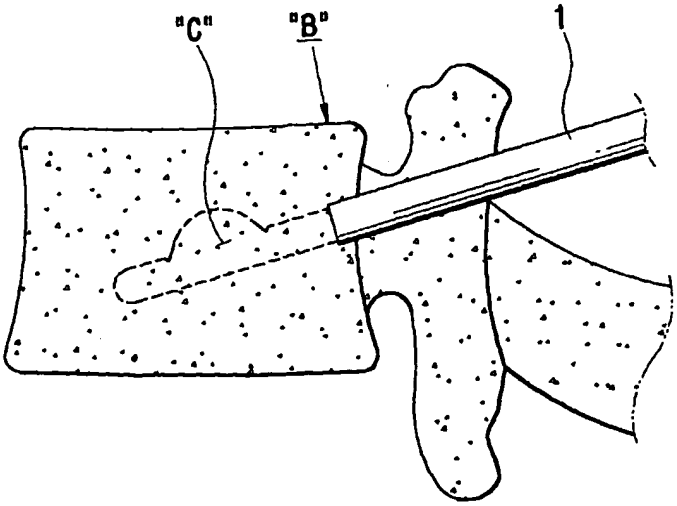


FIG 5a

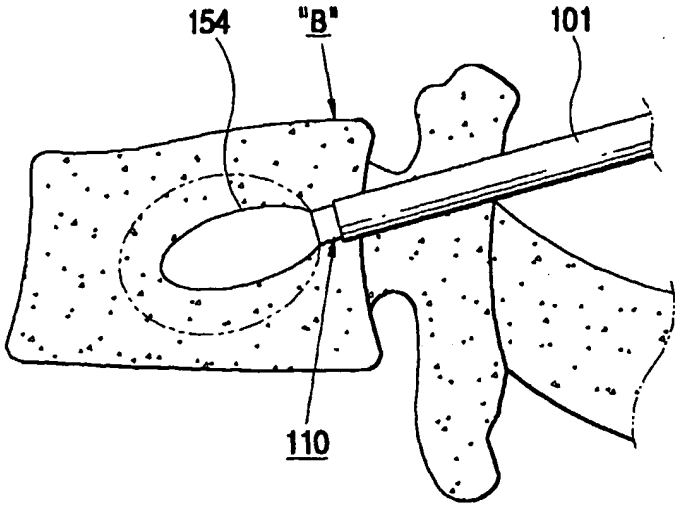


FIG 5b

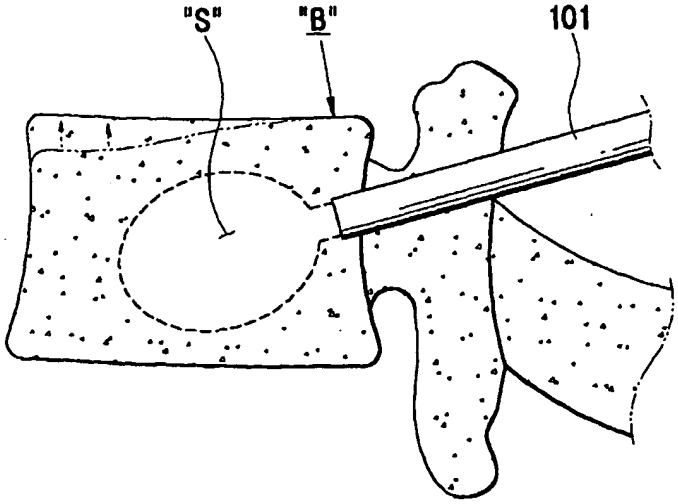
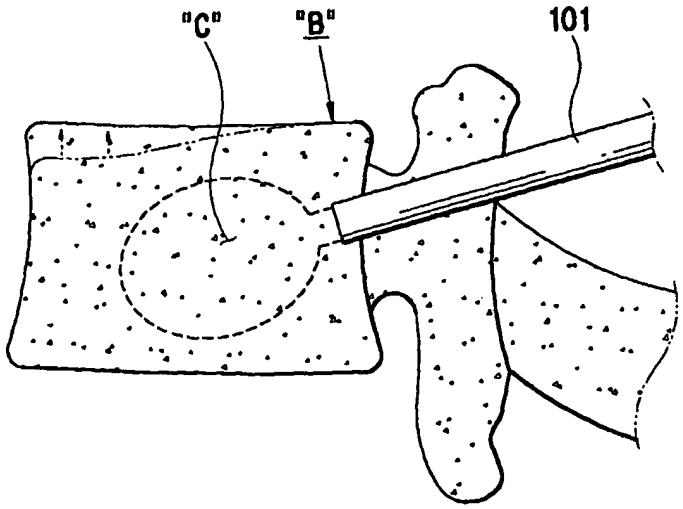


FIG 5c



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2003/002592

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 A61B 17/58

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61B, A61M, A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PAJ, IBM, USPTO, eKIPASS, TIMEPASS

search terms : elastic, expand, hand, bone, osteo*, insert, cement

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 01/60268 A1 (SPINEOLOGY GROUP, LLC) 14 February 2001 Figure 2, 7	1-6
A	WO 98/56301 A1 (Kyphon Inc) 17 December 1998 See the Whole document	1-6
A	WO 95/20362 A1 (Reiley, Mark, A.) 3 August 1995 See the Whole document	1-6
A	US 6,440,138 B1 (Kyphon Inc.) 27 August 2002 See column 3 line 49 ~ column 4 line 5, column 4 line 12 ~ column 4 line 19	1-6
A	US 4,969,888 A (Arie Scholten) 13 November 1990 See Figure 20~28, column 6 line 47 ~ column 7 line 60	1-6

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
06 MARCH 2004 (06.03.2004)	08 MARCH 2004 (08.03.2004)

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